

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application: **(AS ON AMENDED SHEET(S) ANNEXED TO IPER)**

1. (original) An electric circuit breaker (1) for protecting an electrical circuit (3) against excessive current loads, comprising

- a switch (11) to be arranged in said electrical circuit (3);
- first means (13) for causing said switch (11) to break said electrical circuit (3) in response to a tripping signal (14);
- means (17) for receiving (IF) and storing (MEM) a programmable current threshold command (CC);
- means (15) for detecting a current level (CL) in said electrical circuit (3); and
- processing means (16) for generating said tripping signal (14.) depending on said stored programmable current threshold command (CC) and said detected current level (CL);

characterized by

- second means (12) for causing said switch (11) to break said electrical circuit (3) if a current flowing in said electrical circuit exceeds a predetermined rated current (I_R) for more than a specified duration (31, 32).

2. (original) The electric circuit breaker (1) according to claim 1, said second means (12) comprising

- a thermal current level detection element; and
- means for causing said switch (11) to break said electrical circuit (3) if said thermal current level detection element exceeds a temperature threshold.

3. (currently amended) The electric circuit breaker according to ~~any one of the claim 1 or 2~~ claim 1, said second means (12) comprising

- electromagnetic current level detection means including a coil; and
- means for causing said switch (11) to break said electrical circuit (3) if a magnetic force generated by said coil exceeds a threshold.

4. (original) The electric circuit breaker (1) according to claim 1, said second means (12) comprising

- a thermal current level detection means for thermally detecting an amount of current (I) flowing in said electrical circuit;
- means for causing said switch to break said electrical circuit (3) if said thermal current level detection means exceeds a temperature threshold determining the rated current (I_1) of said electrical circuit breaker (1);
- electromagnetic current level detection means including a coil for generating a magnetic force in accordance with the amount of current (I) flowing in said electrical circuit (3); and

- means for causing said switch means to break said electrical circuit if said magnetic force generated by said coil exceeds a force threshold (I_2);
- said electromagnetic current detection means and said thermal current level detection means being dimensioned such that an electrical current level (I_2) corresponding to said force threshold is higher than said rated electrical current level (I_1).

5. (currently amended) The electric circuit breaker (1) according to ~~any one of the claims 1 to 4~~ claim 1, wherein

- said switch (11) comprises a mechanical interruption element in series with a solid state interruption element;
- said second means (12) for causing said switch to break said electrical circuit if a current (I) flowing in said electrical circuit (3) exceeds a predetermined rated current (I_1) is arranged to trip said mechanical interruption element; and
- said first means (13) for causing said switch to break said electrical circuit in response to a tripping signal (14) is arranged to trip said solid state interruption element.

6. (currently amended) The circuit breaker according to ~~any one of the claims 1 to 5~~ claim 1, wherein said first means (13), said second means (12) and said switch (11) are integrated into a single unit.

7. (currently amended) The electric circuit breaker (1) according to ~~any one of the~~

~~preceding claims~~ claim 1, wherein said means (15) for detecting a current level in said electrical circuit comprises

- means (R) for converting an electrical current flowing in said electrical circuit into a voltage; and
- means (151) for detecting said voltage and outputting a corresponding current level detection signal (CL).

8. (original) The electric circuit breaker (1) according to claim 7, wherein said means (15) for converting an electrical current into a voltage comprises a shunt impedance (R) or an arrangement of coils magnetically coupled to constitute a transformer or a hall effect device or a magnetoresistor or a Rogosky coil.

9. (currently amended) The electric circuit breaker (1) according to ~~any one of the~~ preceding claims claim 1, wherein said processing means (16) is adapted to generate said tripping signal (14) after said detected current level (CL) has continuously exceeded said programmed current threshold (I_3, I_4, I_5) for a specified duration T_j .

10. (original) The electric circuit breaker (1) according to claim 9, wherein said specified duration can be programmed to depend on the detected level of current (CL) in said electric circuit (3).

11. (currently amended) The electric circuit breaker according to claim 9-~~or~~10,

comprising means (17) for receiving and storing a command which specifies said duration T_j .

12. (currently amended) The electric circuit breaker (1) according to claim 10-~~or 11~~, comprising

- means for storing a second current threshold (I_1) higher than said programmed current threshold (I_3, I_4, I_5);
- said specified duration being a first duration, predetermined or programmed, if said detected current level (CL) is above said programmed current threshold (I_3, I_4, I_5) and below said second current threshold (I_1), and a second duration, predetermined or programmed, and shorter than said first duration if said detected current level (CL) is above said second current threshold (I_1).

13. (original) The electric circuit breaker (1) according to claim 12, comprising

- means to receive a second current threshold command;
- said second current threshold storing means being adapted to store said second current threshold in accordance with said received second current threshold command.

14. (currently amended) The electric circuit breaker (1) according to claim 12-~~or 13~~, wherein

- said programmable current threshold (I_3, I_4, I_5) is lower than said rated current level (I_1); and

- said second current threshold (I_1) is lower than the current level (I_2) corresponding to said force threshold.

15. (original) The electric circuit breaker (1) according to claim 9, wherein said processing means (16) is adapted to

- provide a plurality of functional relations (331, 332, 333) each specifying for a plurality of current levels (I) a respective associated duration (t); and
- select one of said functional relations (331, 332, 333) in accordance with said current threshold command (CC).

16. (original) The electric circuit breaker (1) according to claim 15, wherein said functional relations are stored in said processing means (16) in the form of tables or in the form of software routines for calculating said functional relations.

17. (currently amended) The electric circuit breaker (1) according to ~~any one of the preceding claims~~ claim 1, comprising means (17) for receiving a circuit close command; and means (13) for operating said switch (11) to close the electrical circuit in response to said circuit close command.

18. (currently amended) The electric circuit breaker (1) according to ~~any one of the preceding claims~~ claim 1, comprising means (17) for receiving a circuit interrupt command; and means (13) for operating said switch (11) to break said electrical circuit

(3) in response to said circuit interrupt command.

19. (currently amended) The electric circuit breaker (1) according to ~~any one of the preceding claims~~ claim 1, comprising powerline communication means (171, IF) for receiving said commands via a public electric power line (LV, 2) which feeds said electric circuit (3) through said switch (11).

20. (currently amended) The circuit breaker according to ~~any one of the preceding claims~~ claim 1, wherein

- said first means (13) comprises a coil (131) for electro magnetically driving a movable member (132) and an auxiliary switch (133) connected in series with said coil (131);
- said switch (11) and said auxiliary switch (133) being mechanically coupled with said movable member (132) for actuation thereby;
- a displacement (θ_{133}) required for opening said auxiliary switch (133) being larger than a displacement (θ_{11}) required for opening said switch (11).

21. (currently amended) An electricity meter (100) for measuring the amount of energy supplied to an electricity consumer (Hn) through an electric circuit (3), comprising an electric circuit breaker (1) according to ~~any one of the preceding claims~~ claim 1.

22. (original) The electricity meter (100) according to claim 21, comprising

- means (18) for multiplying said detected current level (CL) with a supply voltage (U) of said electrical circuit (3) in order to obtain a measure for the instantaneous active and reactive power levels supplied to said electric circuit (3); and
- means (18) for integrating said obtained instantaneous power levels over time in order to obtain the active and reactive energy supplied to said electrical circuit (3).

23. (currently amended) An electricity distribution network, comprising

- at least one electrical power plant for generating electrical power to be distributed to a plurality of consumers (H₁, H₂,..., H_n);
- an electrical power distribution network (HV, MV, LV) for distributing the power generated by said at least one power plant to said consumers (H₁, H₂,..., H_n); and
- a plurality of electric circuit breakers (1) according to any one of the claims 1 to 18 and/or a plurality of electricity meters (100) according to claim 21-~~or 22~~.

24. (original) The electricity distribution network according to claim 23, comprising administration and control facilities (21) for monitoring load conditions in said power distribution network (HV, MV, LV), and for generating at least one of said commands for said electric circuit breakers (1) in accordance with said monitored load conditions.

25. (original) The electricity distribution network according to claim 24, comprising

- a plurality of primary substations (Tp) arranged between high voltage portions

- (HV) and medium voltage portions (MV) of said electricity distribution network;
- a plurality of secondary substations (Ts) arranged between medium voltage portions (MV) and low voltage portions (LV) of said electricity distribution network;
 - communication means (CBT) arranged at at least one of said secondary substations for receiving commands from said administration and control facilities (21), and for generating said current threshold commands (CC) and/or circuit close commands and/or circuit interrupt commands in accordance with commands received from said administration and control facilities (21);
 - power line communication means (24) for injecting said commands generated by said communication means (CBT) into a low voltage portion (LV, 2) of said electricity distribution network for transmission to at least one of said electricity consumers (H1, ..., Hn);
 - said administration and control facilities (21) and said communication means (CBT) being arranged to communicate with each other via a public telephone network (20).

26. (original) The electricity distribution network according to claim 25, wherein said public telephone network is a wireless mobile telephone network (20, 23).